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Forest Biosecurity and Protection

**Ecology and epidemiology of
Nectria fuckeliana on radiata
pine: a research proposal**

I. Background work

- Literature search
- Preliminary isolations
- Identification of fungi
- Familiarity with spore states of *N. fuckeliana*
- Microscopy of infected and healthy wood

II. Infection mechanism and disease development in host

- **Purpose:** To understand the cause of the disease and how it spreads.

A. Organisms associated with the disease

- **Isolate organisms from infected and healthy wood**
- **Compare with previous isolations**
- **Compare with DNA data collected by T. Ramsfield**

Preliminary results

- **Isolations:**
N. fuckeliana
strongly assoc.
with discolored
wood, not with
clear wood



- **Some discrepancy between DNA data and isolations**
- **More systematic comparisons needed between isolations and DNA**

B. Environmental conditions associated with spore production, release, and germination

- **Methods**

- ▶ Lab (produce ascospores, macroconidia), using paired cultures
- ▶ Role of pine resin
- ▶ Spore trapping near infected trees in the field OR regular collection, microscopy, and spore germination

C. Does *Nectria* cause the disease?

- **Reproduce disease artificially**
- **Preliminary inoculation trials (Quarantine facility?). Determine:**
 - ▶ nature of the inoculum source (conidia, ascospores)
 - ▶ most effective inoculation method
 - ▶ entry points: injured, healthy bark / living or dead wood

- **Study interactions between *Nectria* and *Sphaeropsis* and compare early disease symptoms**
- **Study interactions between *Nectria* and other organisms isolated from radiata pine**

Expanded study

- **For field-inoculated trees**

Observe disease progress using regular harvesting, reisolation of pathogen, anatomical studies

III. Effect of pathogen on host

- **Purpose**

To determine location of pathogen in the wood, cause of cambial death (fluting symptom), cause of “pathological white wood”

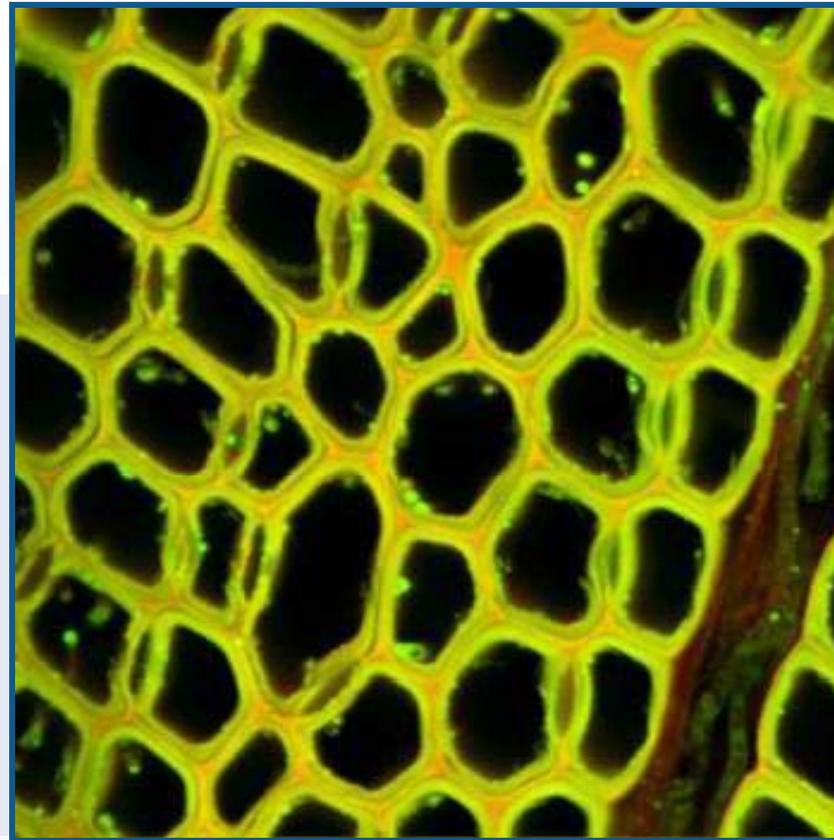
A. Anatomy of diseased wood

- **Methods**

- ▶ Compare healthy and infected wood (confocal microscopy, SEM)
- ▶ Observe early stages of infection in cambium and wood using SEM or other methods

Infected wood by confocal microscopy

From pruned stub trial: a tree that became infected after pruning (no artificial inoculation)



IV. Relationship of disease incidence to environmental conditions (with others)

- **Purpose**

To understand the risk of disease development in new areas, the reasons for the current disease distribution, and how it is influenced by plantation management.

A. Do certain environmental conditions promote disease?

- **Methods**

- Field Studies**

- ▶ Observe fruiting bodies in different seasons (trap spores?) and weather conditions
 - ▶ Correlate disease incidence with specific environmental factors (rainfall, temperature, humidity, prevailing winds, thinning practices)

Logistic challenges

- **Getting samples to the lab in a timely manner**
- **Quarantine facility for preliminary inoculation studies**
- **Lab facilities near field sites to store/produce inoculum, to do isolation work**
- **Collecting weather data within plots**
- **Monitoring spore traps**